

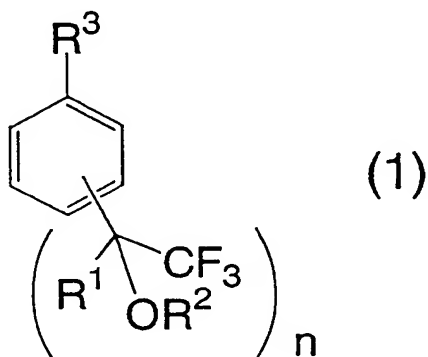
WHAT IS CLAIMED IS:

1. A process for producing a fluorine-containing, polymerizable styrene monomer represented by the formula (2), the process comprising the steps of:

(a) reacting a compound represented by the formula (1) with a compound represented by the formula (3), in the presence of a metal catalyst, thereby producing a compound represented by the formula (4);

(b) reacting the compound represented by the formula (4) with a base, thereby producing a compound represented by the formula (5); and

(c) reacting the compound represented by the formula (5) with hydrogen, in the presence of a metal catalyst and one of a phosphine and an amine, thereby producing the fluorine-containing, polymerizable styrene monomer represented by the formula (2),

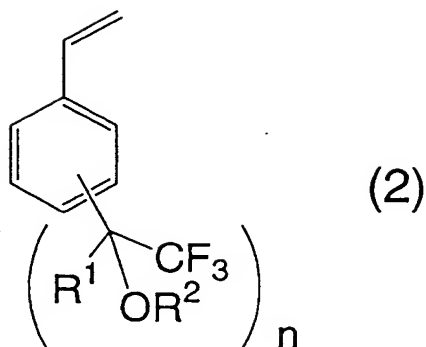


where R^1 a methyl group or trifluoromethyl group,

R^2 is a hydrogen atom, an alkyl group, or an aryl group, each of the alkyl group and the aryl group independently having a carbon atom number of 1 to 25, independently having a straight-chain, branched or ring form, and independently and optionally having at least one of a fluorine atom, an oxygen atom, and a carbonyl bond,

R^3 is a halogen atom or alkylsulfonyl group, and

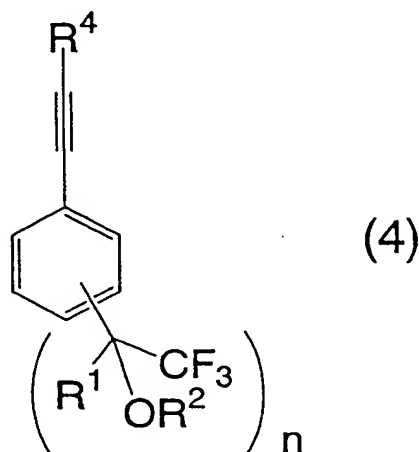
n is 1 or 2,



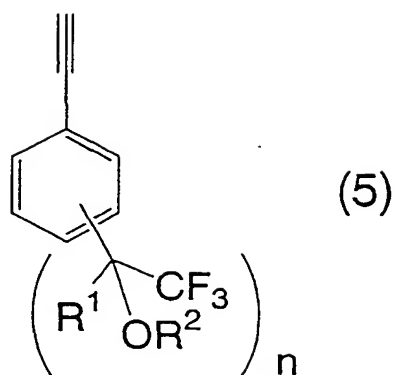
37 where R^1 , R^2 and n respectively correspond to those of the formula
38 (1),



42 where R^4 is $C(OH)R^5R^6$ or $SiR^7R^8R^9$ where each of R^5 to R^9
43 independently has a carbon atom number of 1 to 25, independently is an
44 alkyl group or aryl group, and independently and optionally has, in place
45 of a carbon atom, at least one of a hetero atom and a substituent, and
46 where each of R^5 and R^6 independently and optionally contains a
47 fluorinated alkyl group,



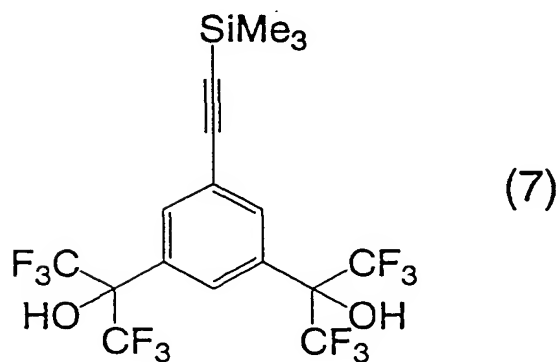
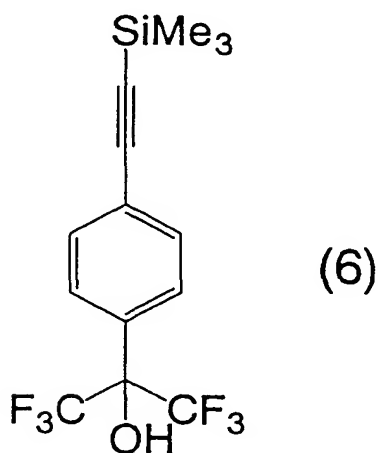
57 where R^1 , R^2 and n respectively correspond to those of the formula
58 (1), and R^4 corresponds to that of the formula (3),

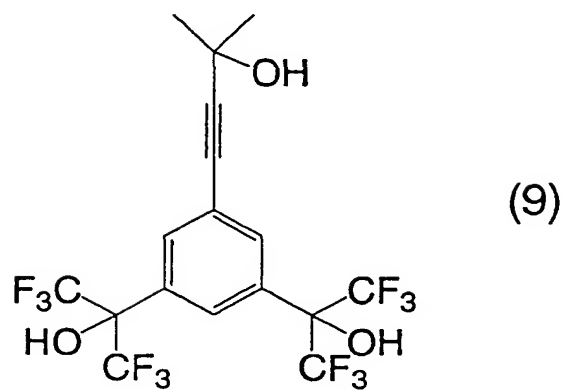
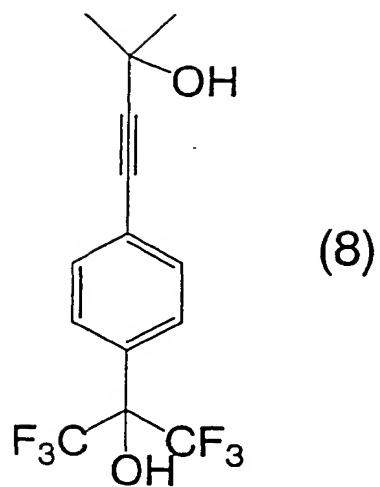


67 where R^1 , R^2 and n respectively correspond to those of the formula

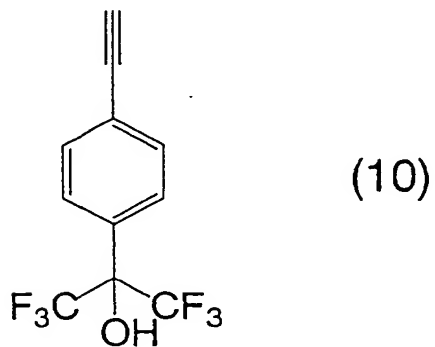
68 (1).

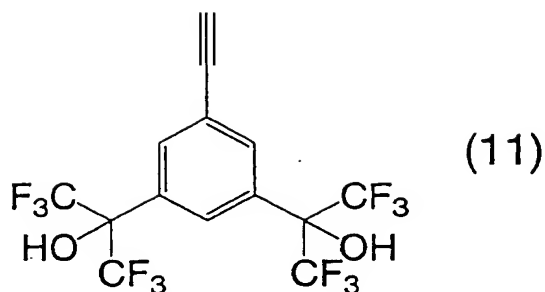
1 2. A process according to claim 1, wherein the compound represented
2 by the formula (4) is a compound represented by one of the formulas (6) to
3 (9).





1 3. A process according to claim 1, wherein the compound represented
2 by the formula (5) is a compound represented by the formula (10) or (11).





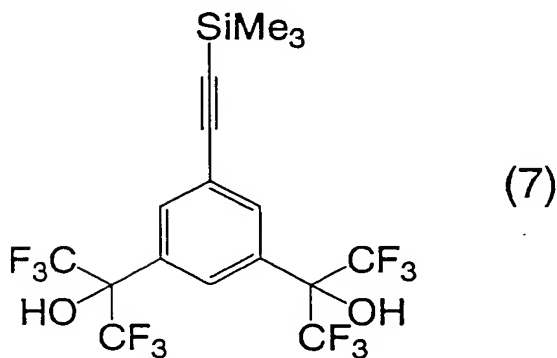
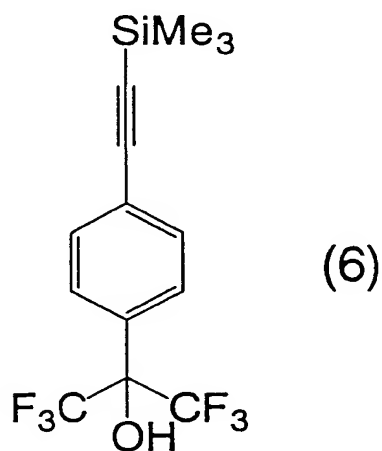
- 1 4. A process according to claim 1, wherein R^1 of the formula (1) is a
2 trifluoromethyl group.
- 1 5. A process according to claim 1, wherein R^2 of the formula (2) is a
2 hydrogen atom.
- 1 6. A process according to claim 1, R^3 of the formula (1) is a bromine
2 atom, iodine atom, or trifluoromethylsulfonyl group.
- 1 7. A process according to claim 1, wherein the metal catalyst of the
2 step (a) is selected from the group consisting of copper complexes, iron
3 complexes, cobalt complexes, nickel complexes, rhodium complexes,
4 palladium complexes, ruthenium complexes, platinum complexes, and
5 combinations of these complexes.
- 1 8. A process according to claim 1, wherein the metal catalyst of the
2 step (a) is a combination of a palladium complex and a copper complex.
- 1 9. A process according to claim 1, wherein the metal catalyst of the
2 step (a) comprises a palladium complex, and wherein the step (a) is
3 conducted in the presence of a phosphine.
- 1 10. A process according to claim 8, wherein the step (a) is conducted in
2 the presence of a base.

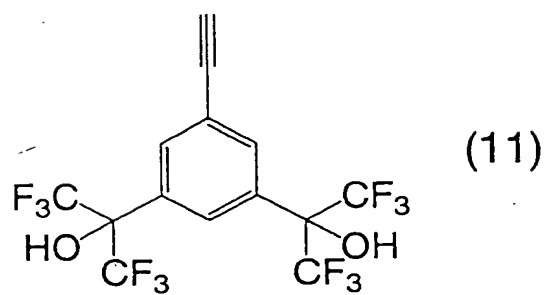
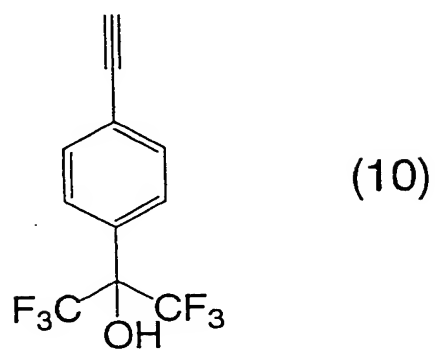
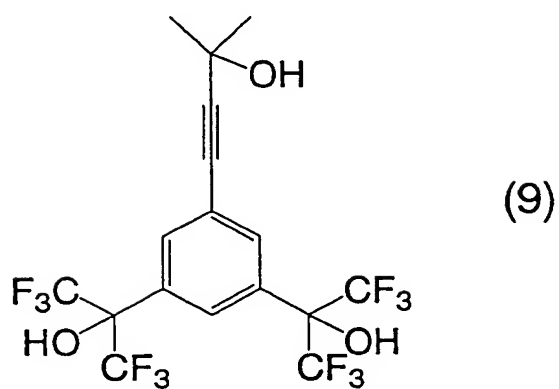
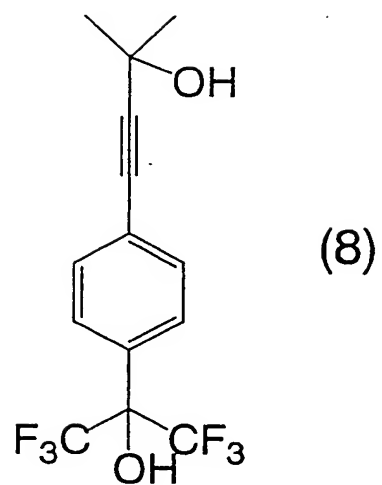
1 11. A process according to claim 1, wherein the base of the step (b) is
2 sodium carbonate or potassium carbonate.

1 12. A process according to claim 1, wherein the metal catalyst of the
2 step (c) comprises a metal selected from the group consisting of palladium,
3 platinum, rhodium, ruthenium, and nickel.

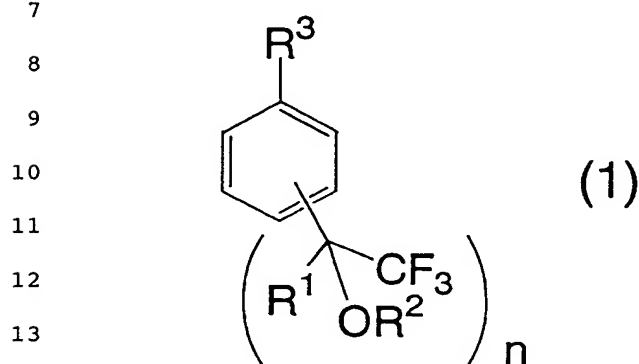
1 13. A process according to claim 12, wherein the metal catalyst of the
2 step (c) comprises palladium and one of barium sulfate and calcium
3 carbonate.

1 14. A compound represented by one of the following formulas (6) to (11),
2 which is an intermediate in the process according to claim 1.





15. A process for producing a fluorine-containing, polymerizable styrene monomer represented by the formula (2), the process comprising the step of reacting a compound represented by the formula (1) with a compound represented by the formula (12), in the presence of a metal catalyst, thereby producing the fluorine-containing, polymerizable styrene monomer represented by the formula (2),

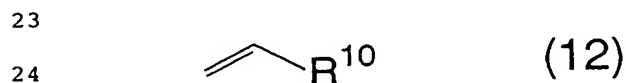


15 where R^1 a methyl group or trifluoromethyl group,

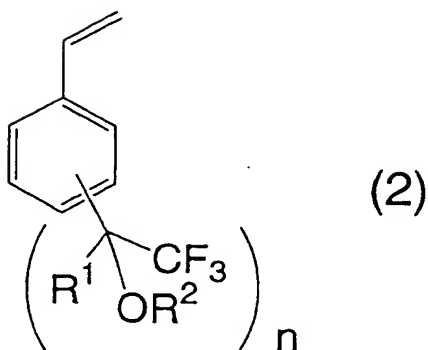
16 R^2 is a hydrogen atom, an alkyl group, or an aryl group, each of the
17 alkyl group and the aryl group independently having a carbon atom
18 number of 1 to 25, independently having a straight-chain, branched or ring
19 form, and independently and optionally having at least one of a fluorine
20 atom, an oxygen atom, and a carbonyl bond,

21 R^3 is a halogen atom or alkylsulfonyl group, and

22 n is 1 or 2,



26 where R^{10} is a hydrogen atom, MgX , $SnR^{11}R^{12}R^{13}$, $SiR^{14}R^{15}R^{16}$, or
27 $B(OR^{17})(OR^{18})$ where each of R^{11} to R^{18} independently has a carbon atom
28 number of 1 to 25, independently is an alkyl group or aryl group, and
29 independently and optionally has, in place of a carbon atom, at least one of
30 a hetero atom and a substituent, and where X represents a halogen atom,



38 where R¹, R² and n respectively correspond to those of the formula
39 (1).

1 16. A process according to claim 15, R³ of the formula (1) is a bromine
2 atom, iodine atom, or trifluoromethylsulfonyl group.

1 17. A process according to claim 15, wherein the metal catalyst is
2 selected from the group consisting of iron complexes, cobalt complexes,
3 nickel complexes, rhodium complexes, palladium complexes, ruthenium
4 complexes, and platinum complexes.

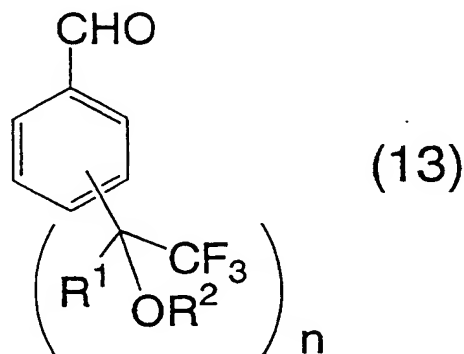
1 18. A process according to claim 15, wherein the step is conducted in the
2 presence of a phosphine.

1 19. A process according to claim 15, wherein the step is conducted in the
2 presence of a base, in case that R¹⁰ of the formula (12) is a hydrogen atom
3 or B(OR¹⁷)(OR¹⁸).

1 20. A process according to claim 15, wherein the step is conducted in the
2 presence of a nucleophilic reagent, in case that R¹⁰ of the formula (12) is
3 SiR¹⁴R¹⁵R¹⁶.

1 21. A process for producing a fluorine-containing, polymerizable styrene
2 monomer represented by the formula (2), the process comprising reacting a

compound represented by the formula (13) with a compound represented by the formula (14) or (15), in the presence of a base, thereby producing the fluorine-containing, polymerizable styrene monomer represented by the formula (2),



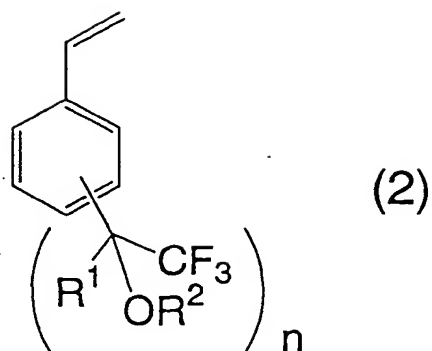
where R^1 a methyl group or trifluoromethyl group,

R^2 is a hydrogen atom, an alkyl group, or an aryl group, each of the alkyl group and the aryl group independently having a carbon atom number of 1 to 25, independently having a straight-chain, branched or ring form, and independently and optionally having at least one of a fluorine atom, an oxygen atom, and a carbonyl bond,

n is 1 or 2,



where R^{19} is a C_{1-25} alkyl or aryl group and optionally has, in place of at least one carbon atom, at least one of a hetero atom and a substituent, and where X represents a halogen atom,



38 where R¹, R² and n respectively correspond to those of the formula
39 (13).

1 22. A process according to claim 21, wherein the reacting is conducted
2 by the steps of:

3 (a) treating the compound represented by the formula (14) or (15)
4 with a base in a solvent, thereby obtaining a product containing a
5 carbanion; and

6 (b) adding the compound represented by the formula (13) to the
7 product of the step (a), thereby producing the fluorine-containing,
8 polymerizable styrene monomer represented by the formula (2).